

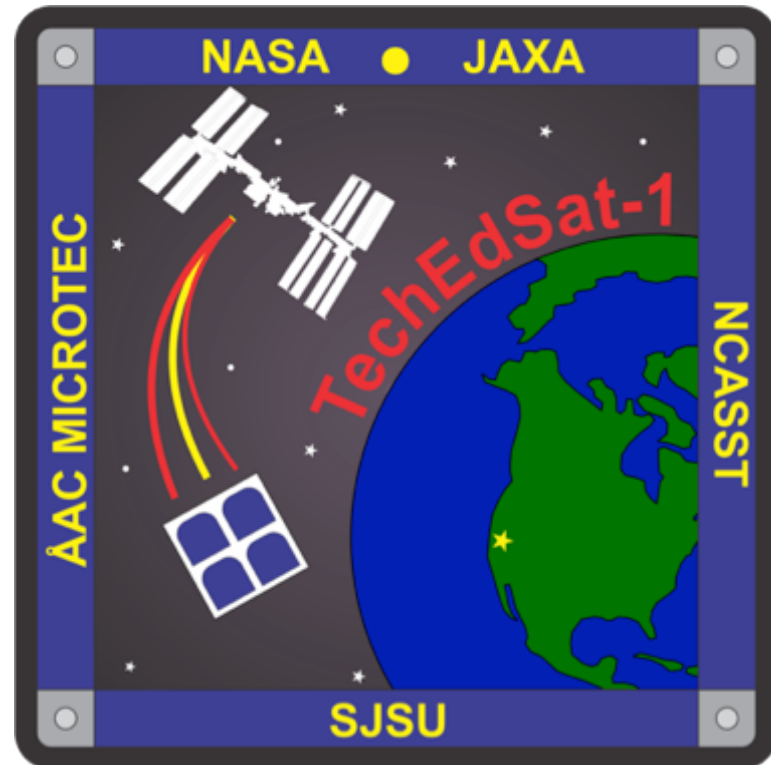


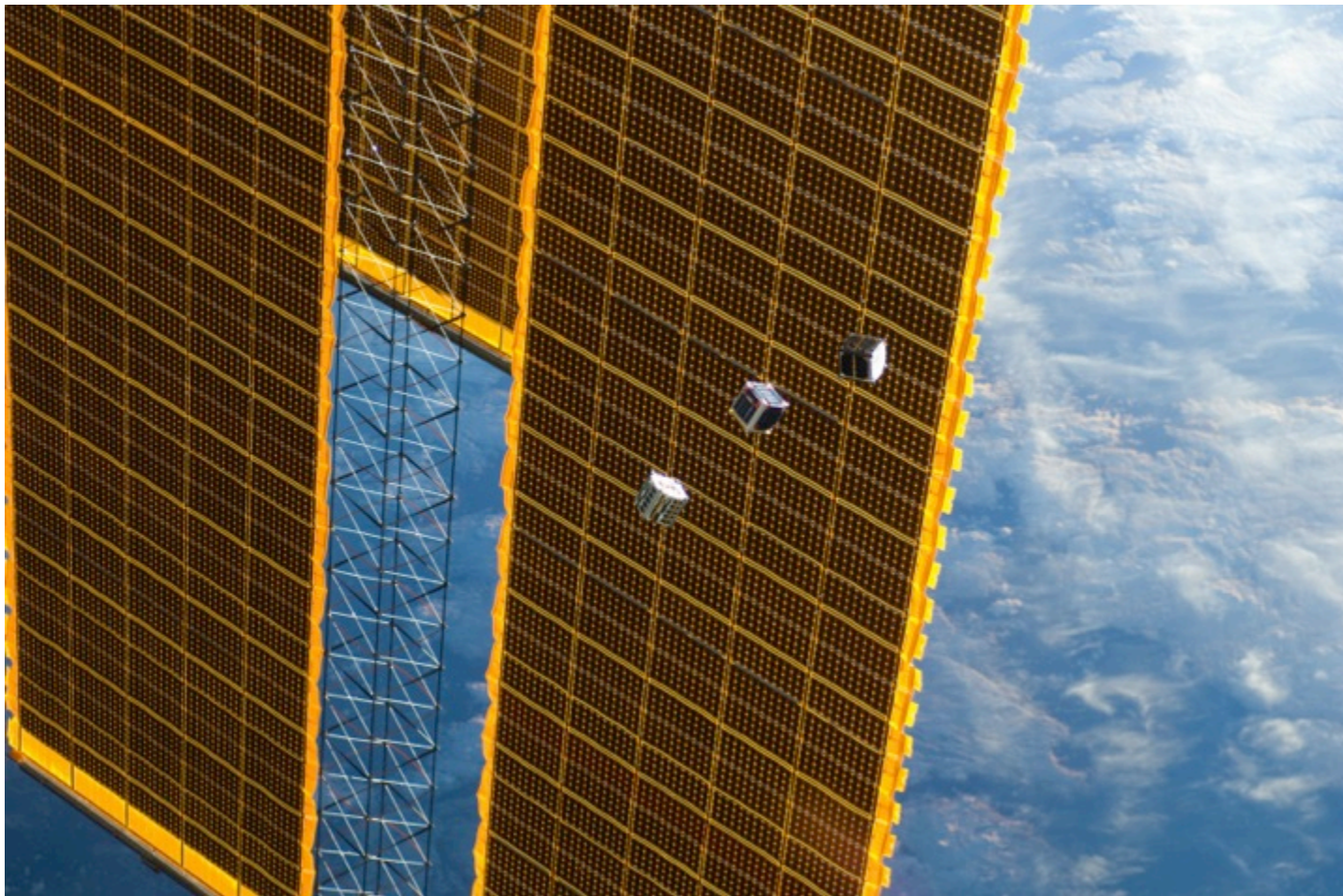
TechEdSat - An Educational 1U CubeSat Architecture Using Plug- and-Play Avionics

Outline



- Introduction
- Background
- The team
- About NASA Ames
- About AAC Microtec
- Mission objectives
- Mission results
- Future







Background

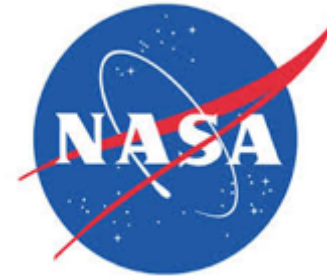


TechEdSat is a 1U cubesat developed in a joint project between:

- NASA Ames Research Center
 - Responsible for Integration and Launch Preparation

- AAC Microtec
 - Avionics, Data Handling System, Application Software

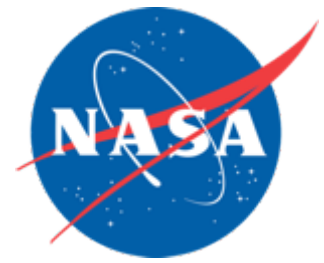
- San Jose State University
 - Students involved in satellite design from A to Z



San José State
UNIVERSITY

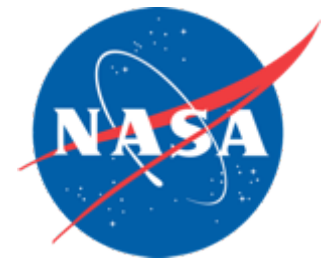


The team



The team at work





About NASA Ames

- Located in California's Silicon Valley
- Established 1939
- ~2,500 staff
- Research and engineering in diverse areas:
 - Small spacecraft
 - Low-cost missions
 - Entry systems
 - Supercomputing
 - NextGen air transportation
 - Airborne science
 - Biology and astrobiology
 - Exoplanets
 - Autonomy and robotics
 - Lunar science
 - Human systems integration
 - Wind tunnels
- Emphasis on partnerships and collaborations with universities, industry, other agencies





AAC Microtec™

About AAC Microtec

AAC Microtec develops and supplies satellites, sub-systems, and components to the small satellite market

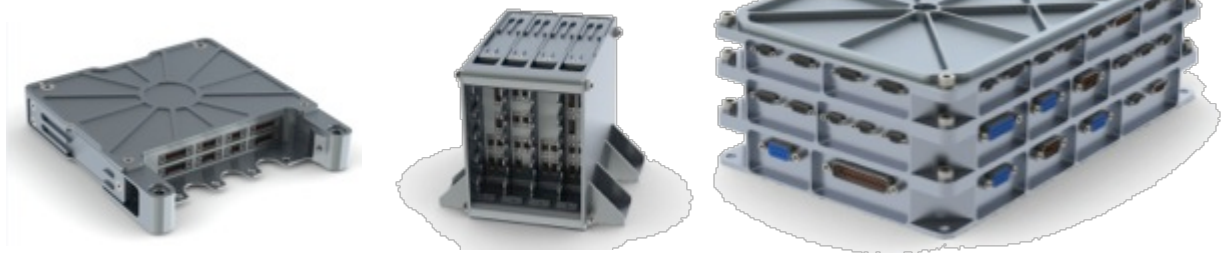
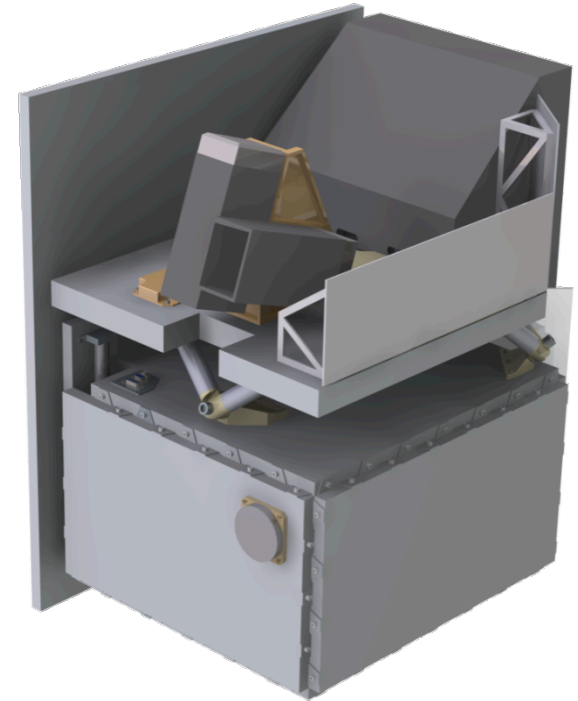
Spin-off company from Uppsala University,
The Ångström Laboratory, Sweden in 2005

Locations

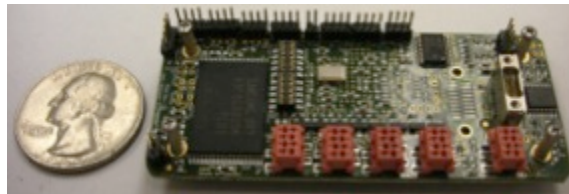
- Head Quarters: Uppsala Science Park, Sweden
 - AAC Microtec North America Inc., NASA Ames CA
 - Partners: HTL (JP), Soletop (Kr)
-

~30 Employees

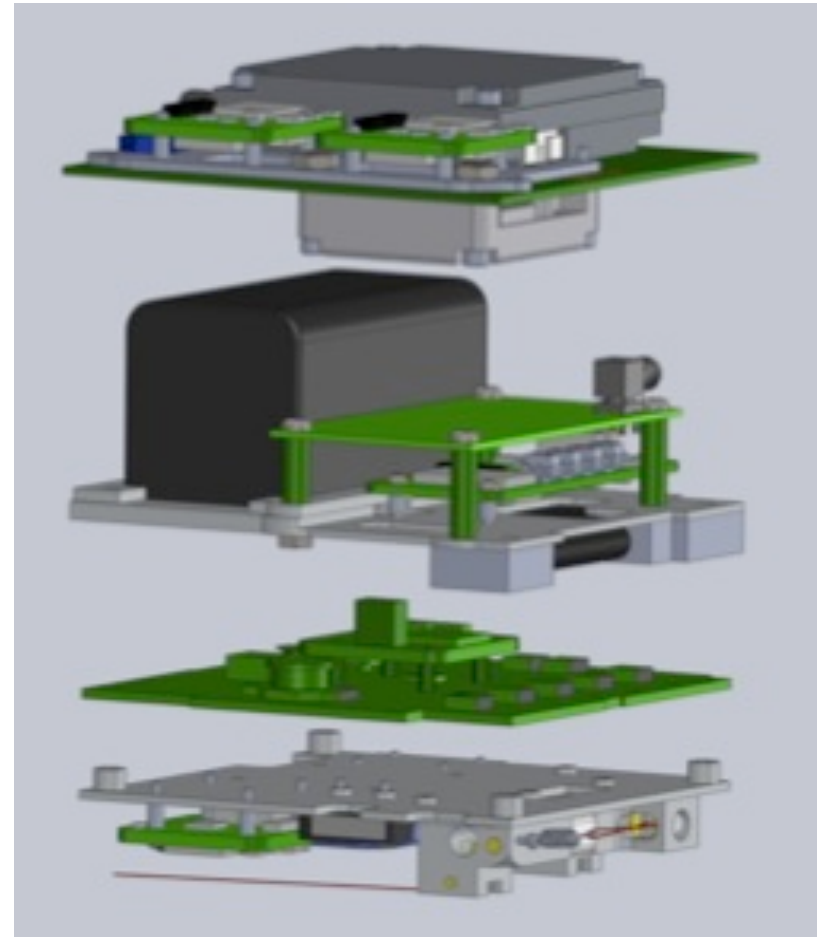
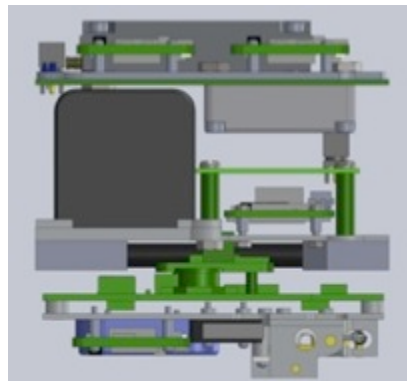
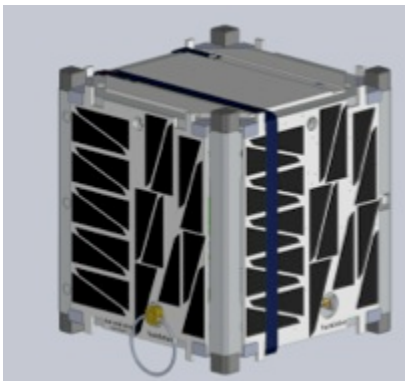
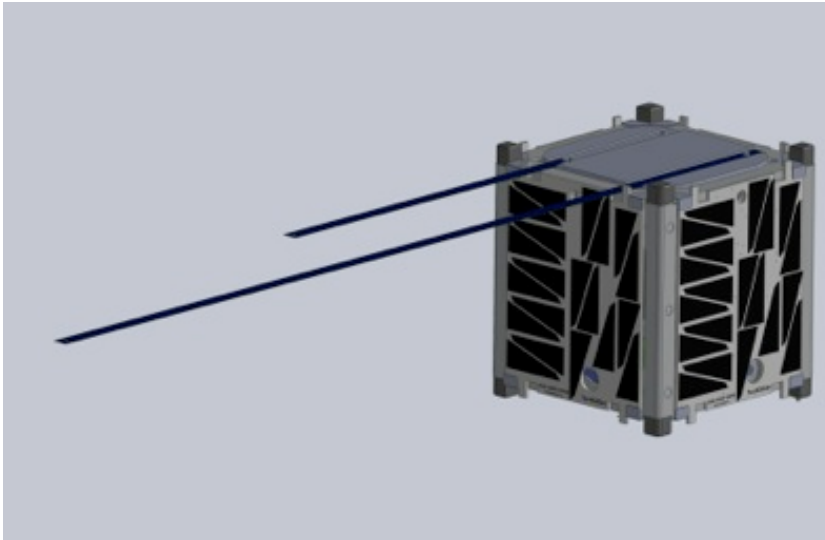
4M€ Revenue, 2014

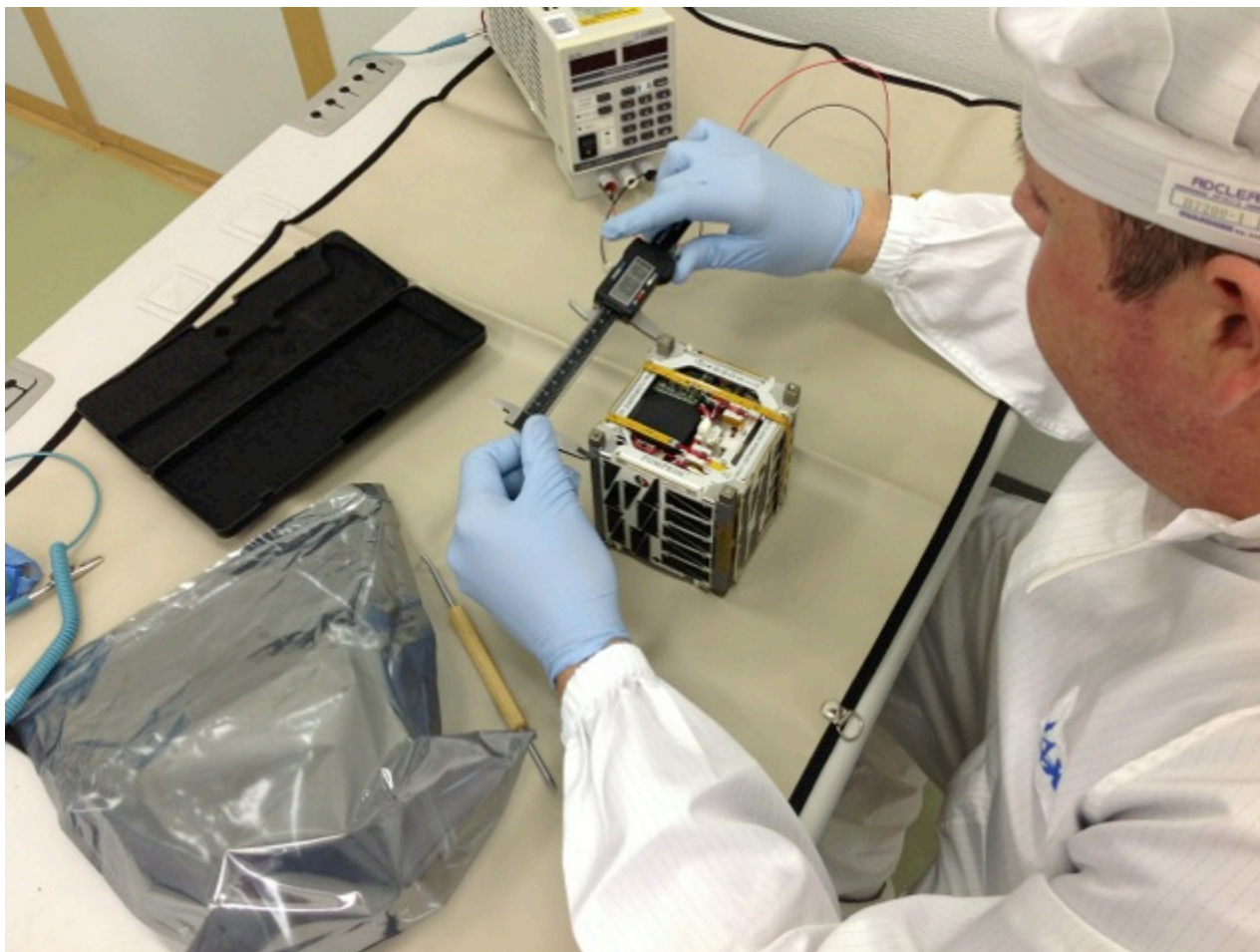


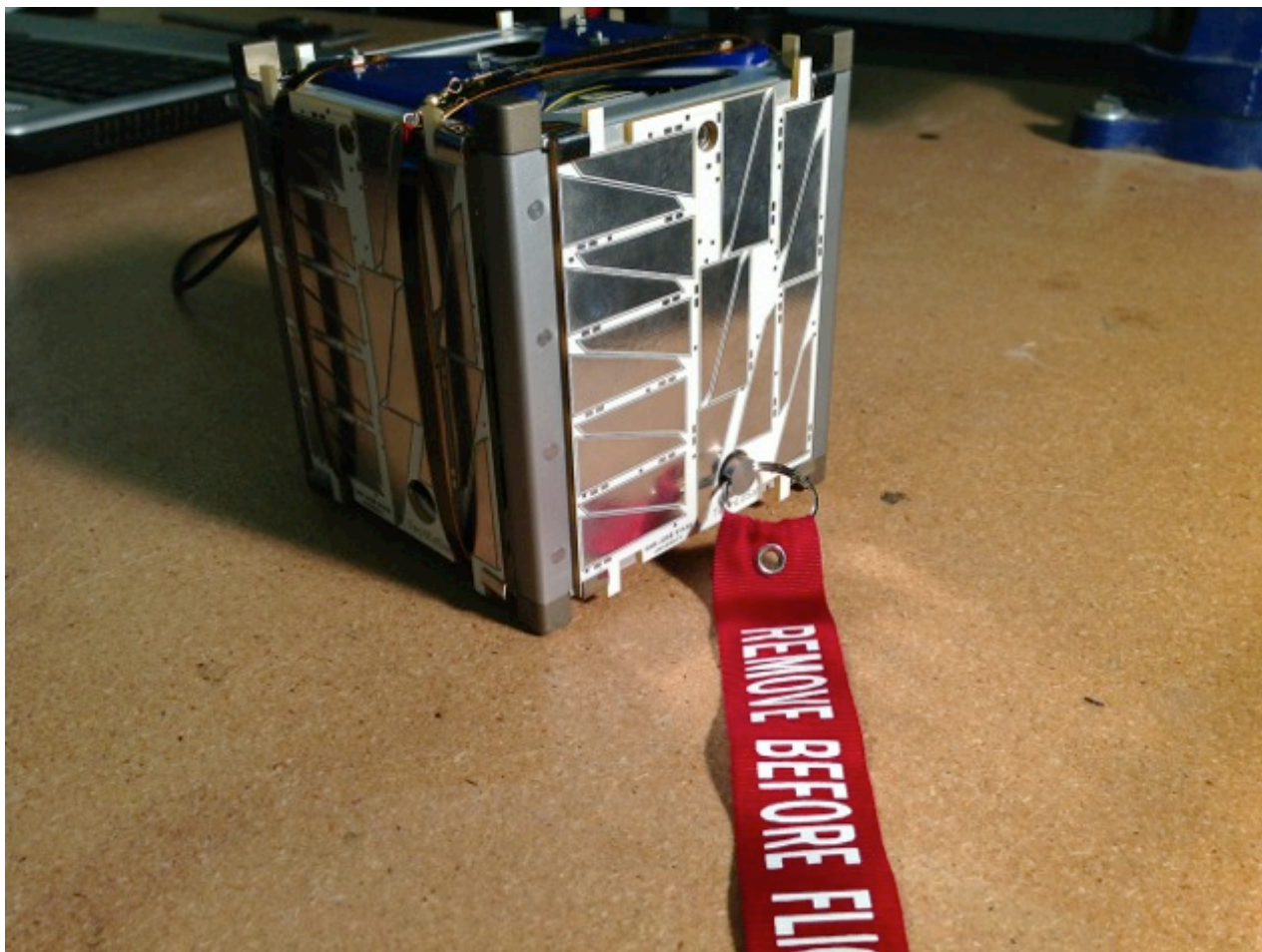
From a pile of small parts...

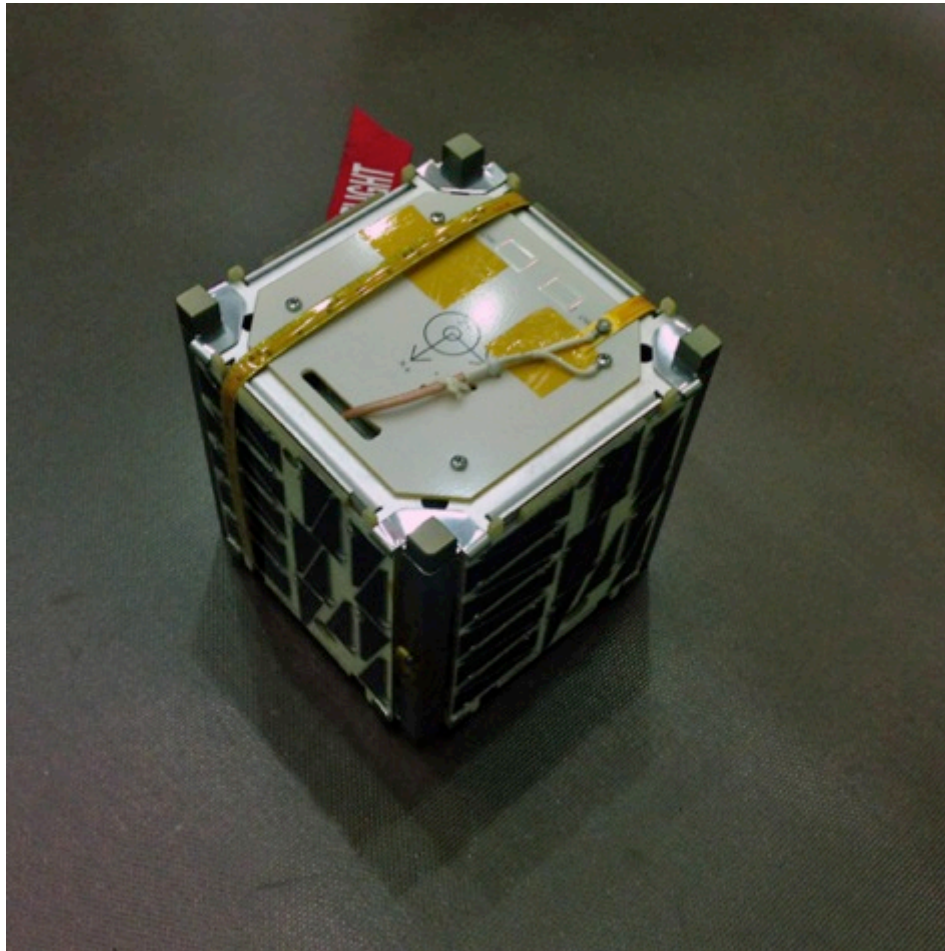


To a complete spacecraft design...

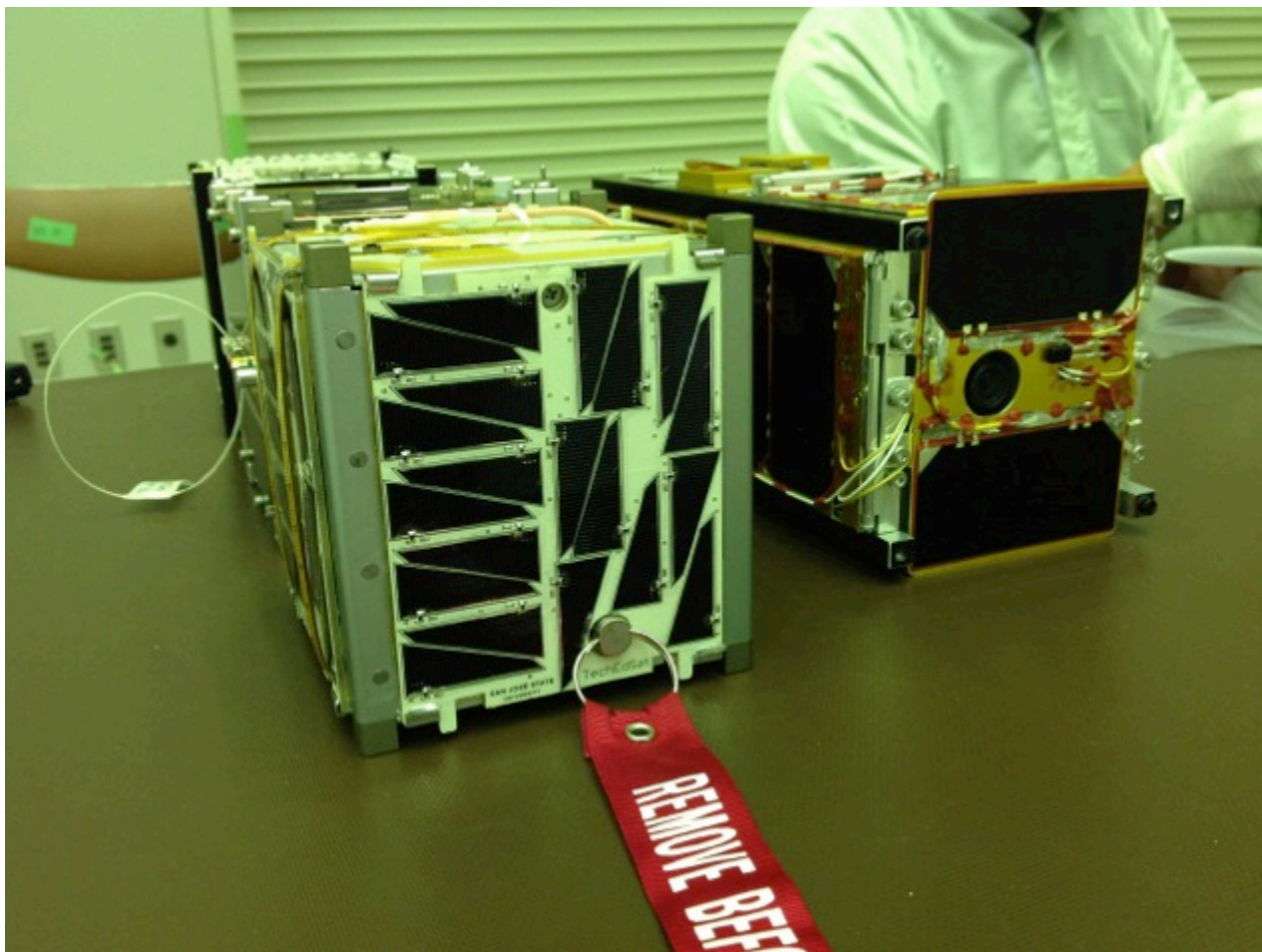




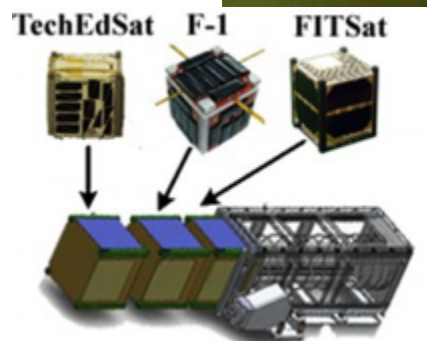
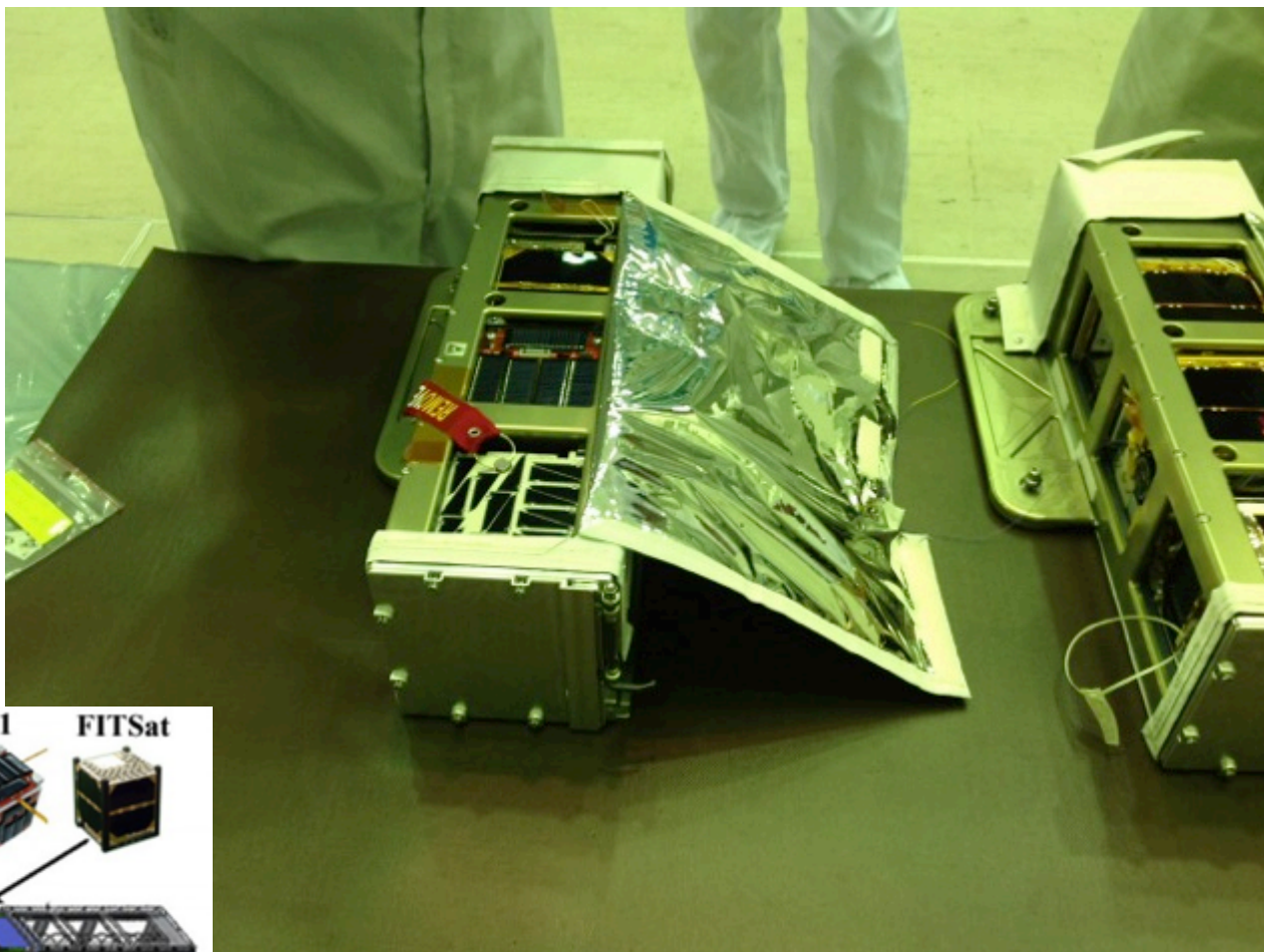




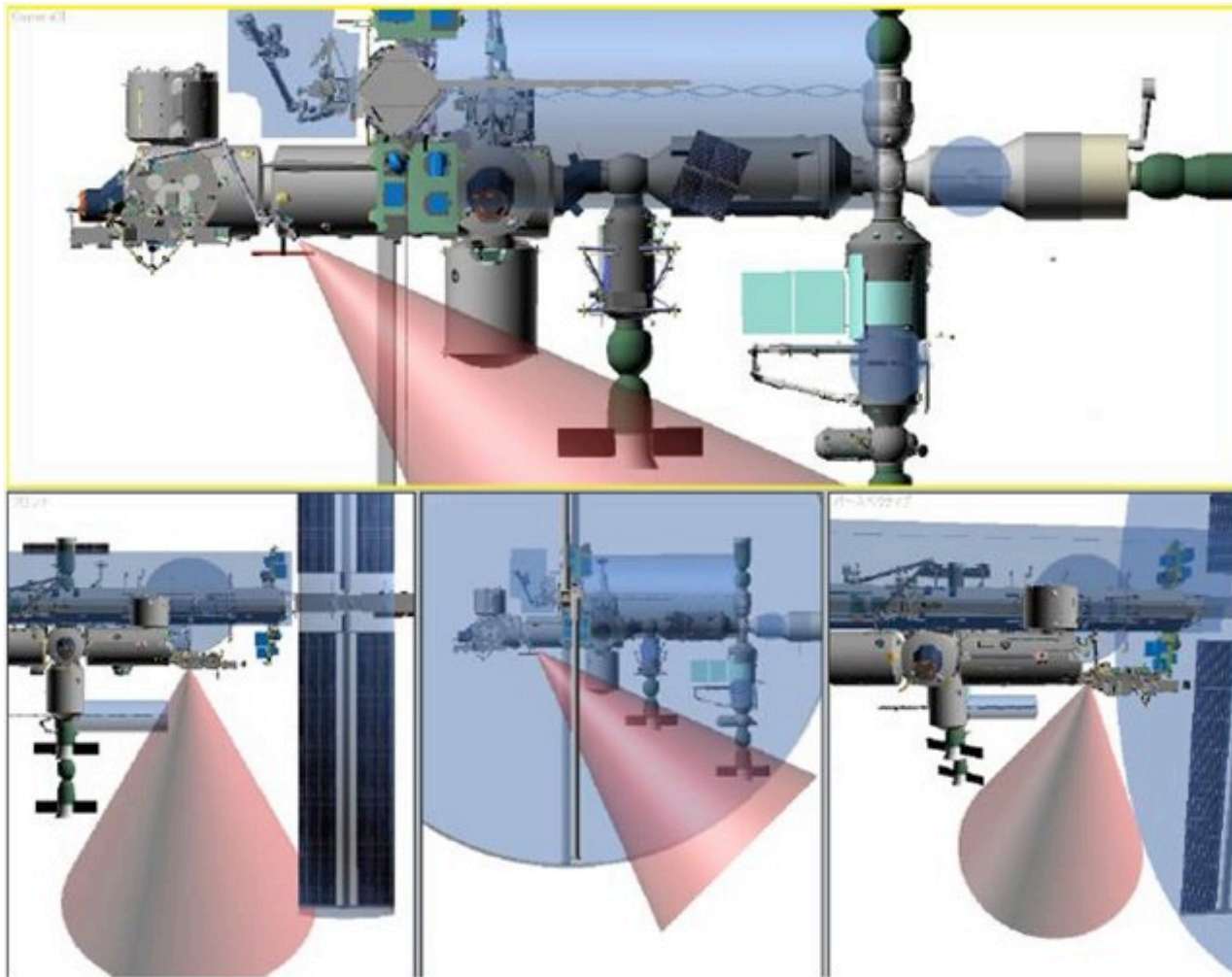


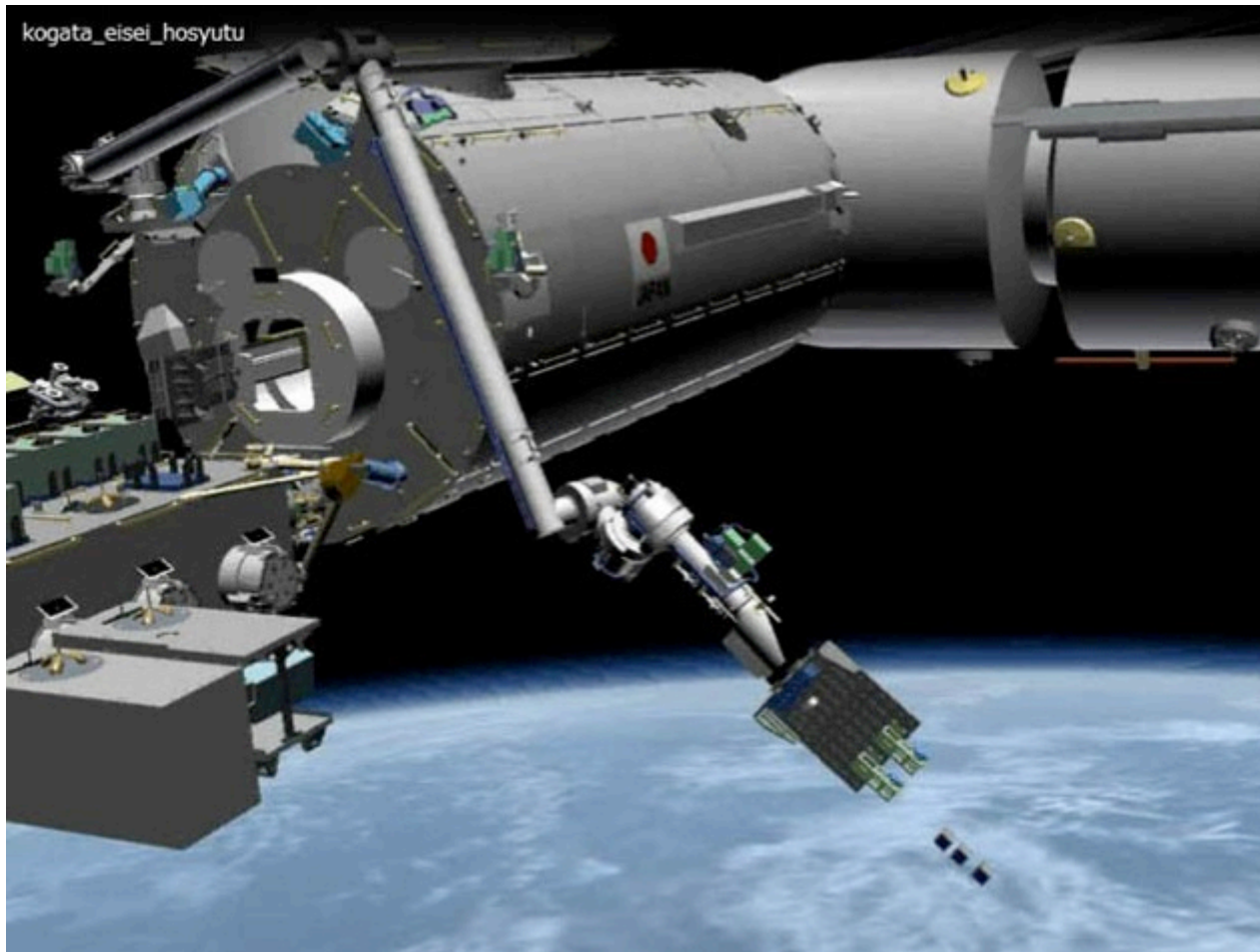


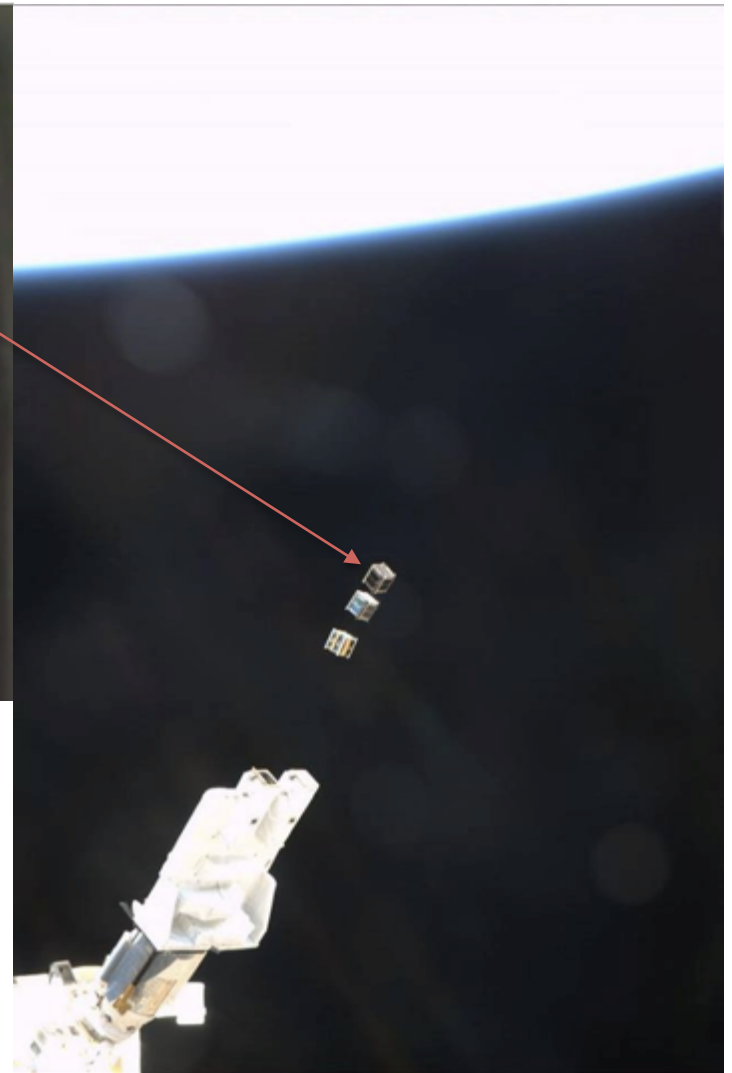
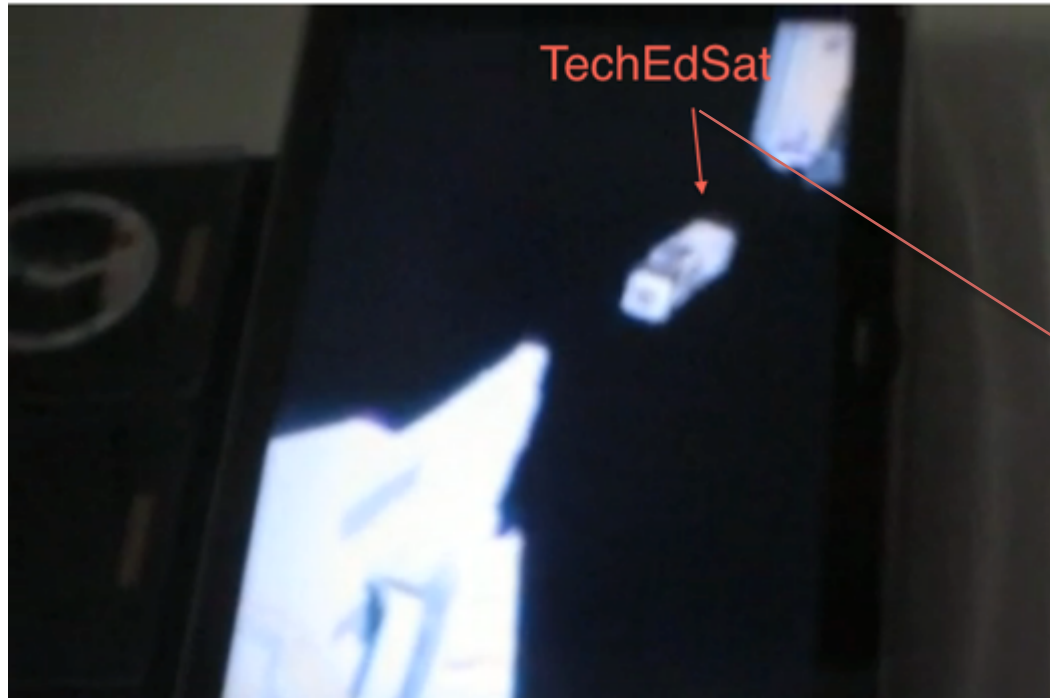


















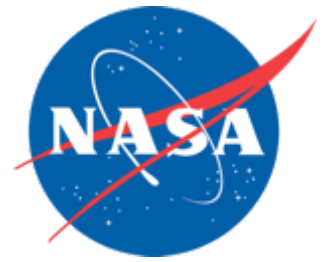






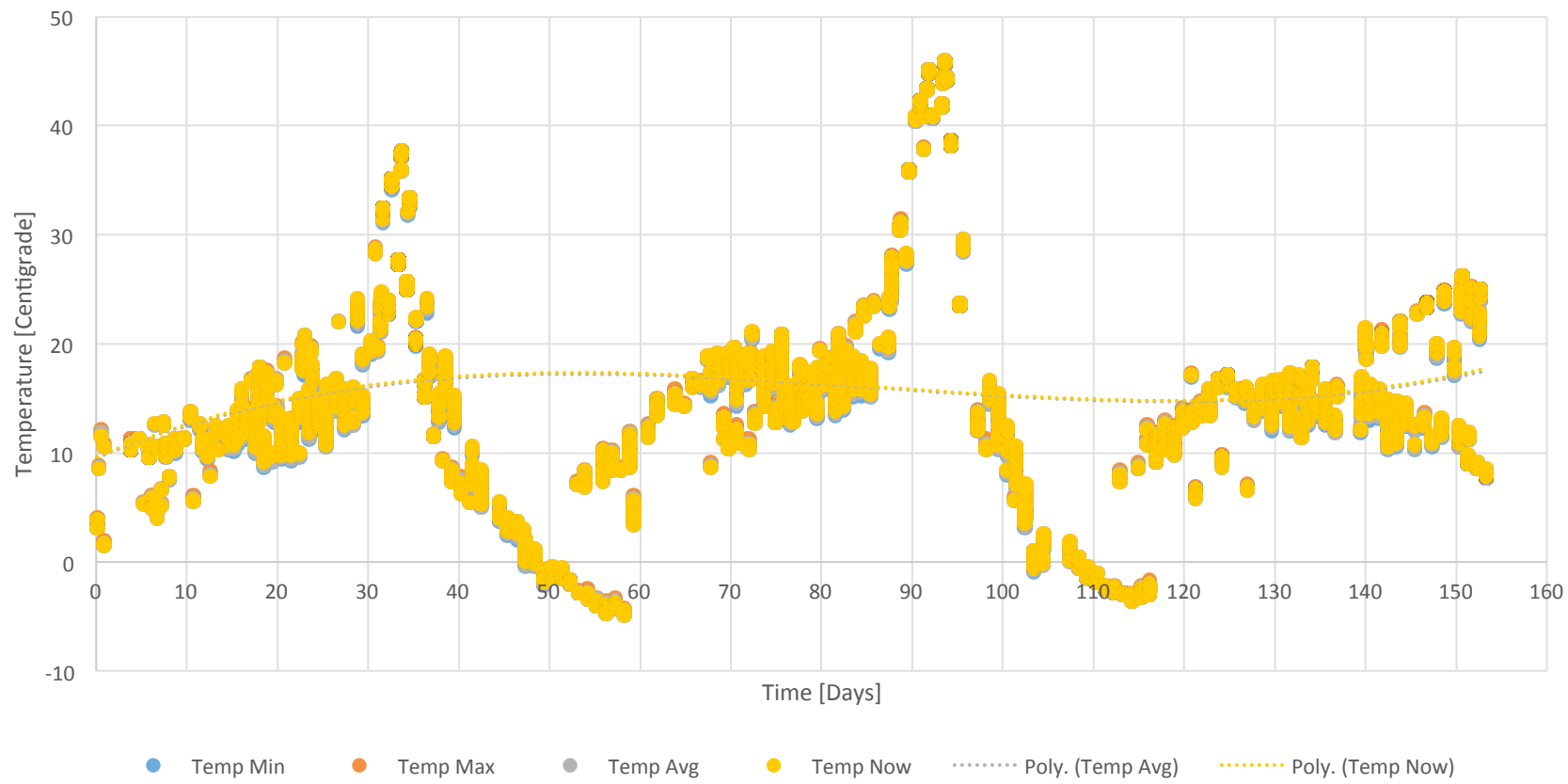


Mission Objectives

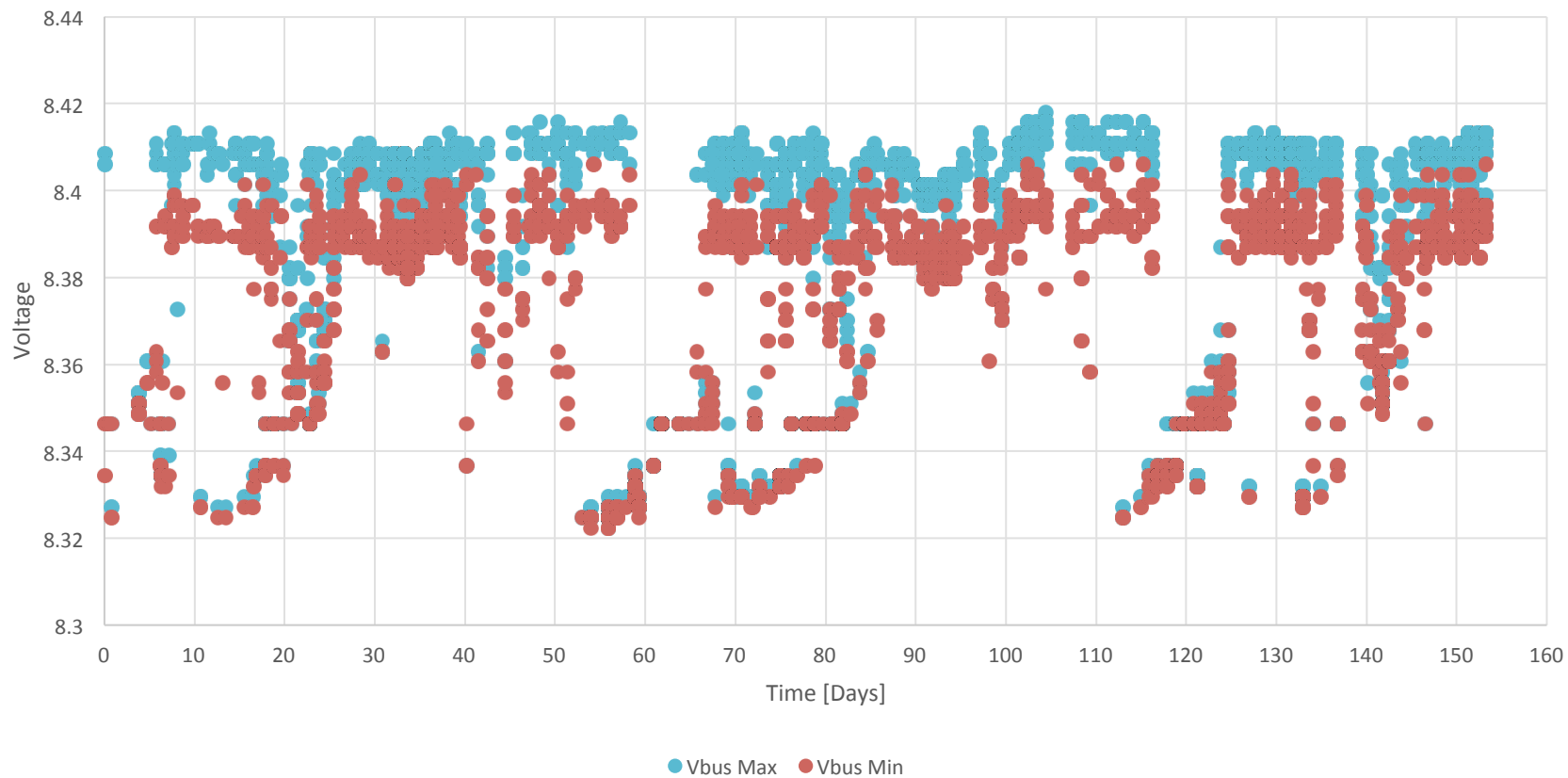


- Build a 1U cubesat within 6 months from kickoff to launch
- Demonstrate and evaluate the Space Plug-and-Play avionics hardware and software from AAC Microtec.
- Investigate both Iridium and Orbcomm intersatellite communication as a method of eliminating the requirement for a physical ground station in Nano satellite missions.
- Demonstrate the capabilities of the JAXA J-SSOD aboard the ISS, and be one of the first cubesats to be deployed from the ISS.

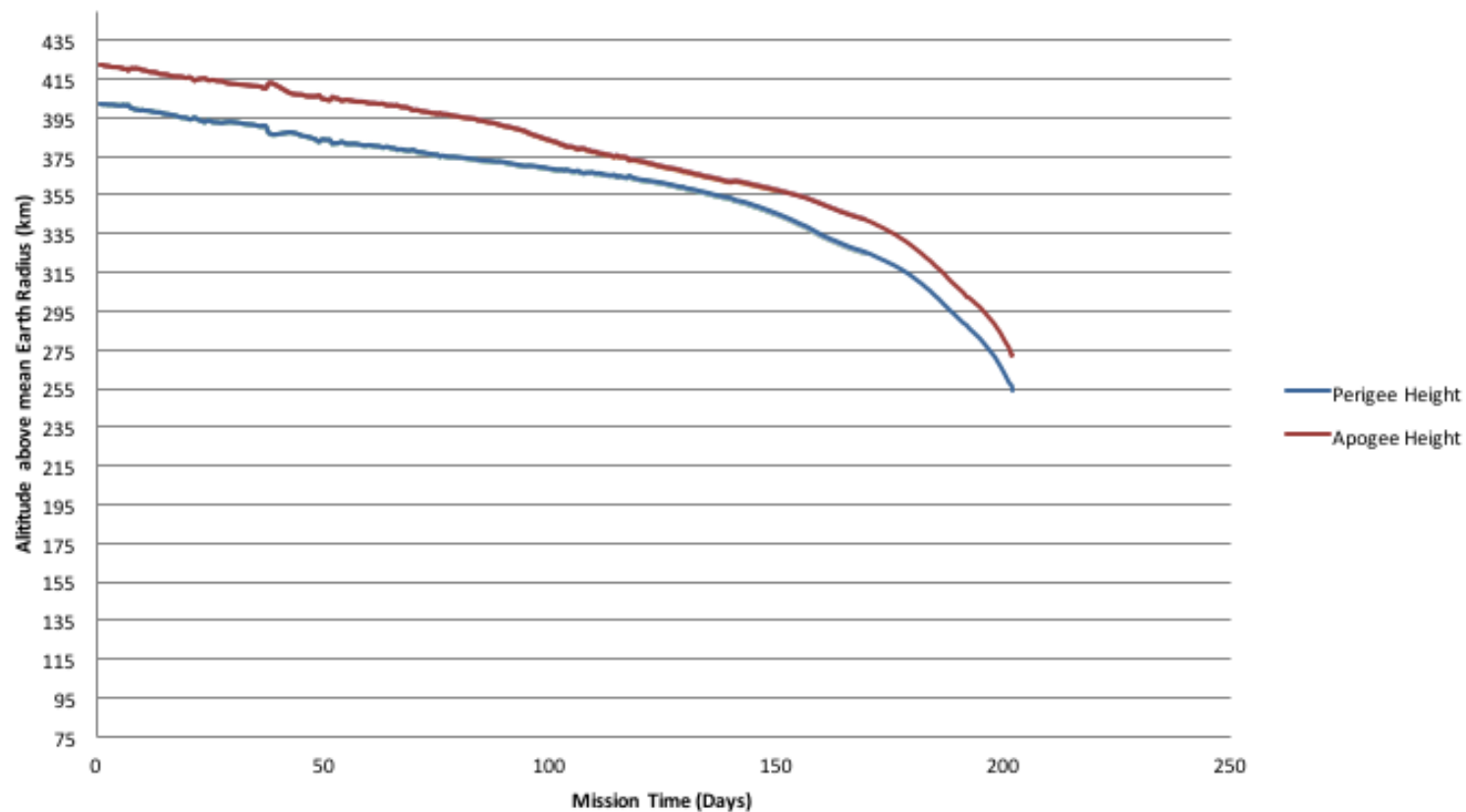
TechEdSat Temperature Distribution vs Days



TechEdSat Voltage Distribution vs Days



TechEdSat-1 Apogee and Perigee





Mission Results



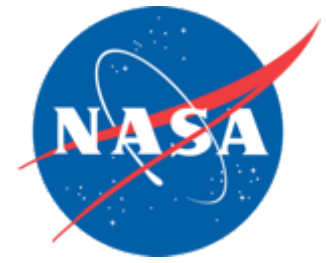
- Fault-tolerant functionality (EDAC on RAM, TMR, etc) has been demonstrated
- One single event latchup on the RAM was detected and automatically corrected
- Rapid Integration Architecture has been demonstrated
- Feasibility of inter-satellite communication as possible downlink for cubesats has been demonstrated from ground due to regulatory issue
 - Demonstrated from orbit on subsequent missions



Future Opportunities



- We fully expect the design philosophy pioneered by TechEdSat to continue, resulting in:
 - High performance, low cost missions
 - Rapid spacecraft development and integration
- NASA Ames and AAC Microtec are assessing mission concepts that demand robust high performance:
 - Deep space science and exploration missions, e.g. to Europa
 - Long-duration Earth-orbiting satellites



Questions?